NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF CIVIL AND WATER ENGINEERING
FACULTY OF INDUSTRIAL TECHNOLOGY
BACHELOR OF ENGINEERING (HONOURS) DEGREE
PART III –SUPPLEMENTARY EXAMINATION-JULY 2006
DESIGN OF STRUCTURES I– TCW 3103

INSTRUCTIONS

Answer 4 Questions –
Open Book Examination
All questions carry equal marks   Time: 4hours
                                                         Total Marks:100

QUESTION ONE

**A reinforced concrete floor slab carries a characteristic imposed load of
$3.5 kN/m^2$ and has an effective span of 4.5 meters. Design the floor slab
assuming the following**
$f_{cu} = 35 N/mm^2$; $f_y = 460 N/mm^2$

QUESTION TWO

**A simply supported rectangular beam of 7.0 meters span carries a
characteristic dead load, including self weight of the beam, of 12 kN/m
and a characteristic imposed load of 8 kN/m. The beam dimensions are
b = 275mm and effective depth d = 450mm.
Assuming the following material properties calculate the area of
reinforcement required.
$f_{cu} = 35 N/mm^2$; $f_y = 460 N/mm^2$**

QUESTION THREE

**A reinforced concrete beam is 230mm wide and has an overall depth of
370mm has an effective span of 9.0 meters. The beam carries a
characteristic uniformly distributed dead load , including self weight of
the beam, of 4kN/m and a characteristic imposed load of 5kN/m. Design
the bending reinforcement assuming the following
$f_{cu} = 30 N/mm^2$; $f_y = 460 N/mm^2$,   cover to reinforcement = 40mm**

QUESTION FOUR

A simply supported beam shown in Figure 1.0 supports the loading as shown. Assuming the beam is fully restrained laterally select a suitable UB section in Grade 43 steel to satisfy the bending and shear considerations.

QUESTION FIVE

A proposed 5.0meter long internal column in a rigid jointed steel structure is to be loaded concentrically with a characteristic dead load of 1000kN and a characteristic imposed load of 1000kN. Assuming that fixity at the top and bottom of the column gives effective rotational restraint select a suitable UC section.

QUESTION SIX

A timber beam has an effective span of 3.0meters. It supports a uniformly distributed load of 3.5kN/m including self weight of the beam. Determine a suitable section for the beam using timber of strength class SC3 to satisfy bending, deflection and shear. Assume that the ends of the beam are held in position.

Assume the following

		Modification Factors:
Strength Class of timber	SC 3	
For SC 3 Grade		K3, duration of loading 1.0
Bending stress parallel to grain	= 5.3 N/mm^2	K8 Load sharing system 1.1
Shear stress parallel to grain	= 0.67 N/mm^2	K7 Depth factor
Modulus of Elasticity E	= 5800 N/mm^2	for d = 225 1.032
Long term loading		for d = 200 1.046